DOCUMENT RESUME

ED 216 827 RC 013 387

AUTHOR Holtzman, Wayne H.
TITLE Divergent Thinking as a Function of the Degree of Bilingualism of Mexican-American and Anglo Fourth-Grade Students.
PUB DATE 23 Mar 82
NOTE 27p.; Paper presented at the Meeting of the American Educational Research Association (65th, New York, New York, March 23, 1982).

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Anglo Americans; *Bilingualism; *Bilingual Students; Cognitive Development; Comparative Analysis; *Divergent Thinking; Grade 4; Intelligence Quotient; *Language Fluency; Limited English Speaking; Literature Reviews; *Mexican Americans; Monolingualism; *Verbal Ability
IDENTIFIERS Texas

ABSTRACT

To further investigate the relationship between divergent thinking and bilingualism, 23 Anglos and 108 Mexican Americans from a semi-rural West Texas community and 24 Mexican Americans from San Antonio, enrolled in the fourth grade, of low socioeconomic status, and with an average age of 10 years 6 months, were divided into 5 experimental groups, based on their scores on the Oral Language Proficiency Measure: monolingual English-speaking Anglos; monolingual English-speaking Mexican Americans; monolingual Spanish-speaking Mexican Americans; bilingual limited English, fluent Spanish Mexican Americans; and fluent bilingual Spanish-English Mexican Americans. Subjects were administered the Raven's Standard Progressive Matrices and the figural and verbal portions of the Torrance Tests of Creative Thinking (TTCT). The Ravens scores were a covariate, controlling for possible differences in IQ levels; the dependent variables were the TTCT scales of fluency and of flexibility for both verbal and figural tests. Results showed that the Spanish monolinguals performed significantly better on the TTCT figural tests; and the fluent bilinguals scored significantly higher on verbal fluency than the limited English, fluent Spanish bilinguals. It was concluded that TTCT divergent thinking and the type of intelligence measured by the Ravens appear to be two almost totally independent constructs. (NQA)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED216827

DIVERGENT THINKING AS A FUNCTION OF THE DEGREE OF BILINGUALISM OF MEXICAN-AMERICAN AND ANGLO FOURTH-GRADE STUDENTS*

Wayne H. Holtzman, Jr., Ph.D.
Southwest Educational Development Laboratory
211 East 7th Street
Austin, Texas 78701

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Wayne H. Holtzman, Jr.

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

Paper presented at the 65th Meeting of the American Educational Research Association, March 23, 1982, New York, New York.
Based upon an unpublished dissertation from The University of Texas at Austin.

RC 013387

At a time when controversy over bilingual education is at its highest point ever, it is ironic to find that an increasing number of studies are finding positive cognitive benefits associated with bilingualism. Part of the problem in bilingual education programs has been a lack of trained staff, inadequate instruments for assessing language and a tendency for teachers to treat bilingual children as a homogeneous group. However, for instructional purposes, it is important to know whether a child is a fluent speaker of both languages, a limited speaker of both languages, or to what degree he is dominant in either of the two languages (Jackson and Hidalgo, 1979).

Negative Effects of Bilingualism on Cognitive Development

Support for the belief that bilingualism results in negative effects for a child's cognitive development can be found in the writings of Weinreich (1953). It is assumed that any individual who is able to speak two or more languages has to cope with interlingual interference due to the contact between the languages. Noting that the degree of linguistic differences between the two languages affects the extent to which interlingual interference occurs, Weinreich states that:

> The more numerous the mutually exclusive forms and patterns in each, the greater is the learning problem and the potential area of interference. But the mechanisms of interference...would appear to be the same whether the contact

is between Chinese and French or between two subvarieties of English (1953, pp.1-2).

A rather pessimistic stance has been taken by MacNamara (1966) who says that only a small number of individuals in the world have the ability to become highly competent speakers of two languages. Instead, a "balance effect" occurs in such a way that as a child develops linguistic competence in a second language, a decrement occurs in the linguistic competence of his first language. This is viewed as having a retarding or "seesawing" effect on the child's native language.

Many of the earlier studies supported, at least in part, the notion of bilingualism as a negative factor in a child's cognitive development. Seidl (1937) reported that monolinguals performed better than bilinguals on the Stanford-Binet scale which requires much verbal ability, but bilinguals obtained superior scores on the Arthur Point Scale of Performance, a nonverbal test. The same pattern of results was obtained by Darcy (1946) who carried out a study using 212 Italian-American preschool children. Bilinguals scored significantly higher on the nonverbal Atkins Object-Fitting Test but significantly lower than monolinguals on the Stanford-Binet Intelligence Scale.

A more recent study by Levinson (1959) added additional support to the negative influence of bilingualism on cognitive

development. Preschool monolingual and bilingual Jewish native Americans were administered various verbal and nonverbal IQ tests. Although differences between groups were not significant on most of the tests, monolinguals scored higher on the Stanford-Binet and on the Arithmetic, Vocabulary, and Picture Arrangement subtests of the WISC.

The majority of these studies lacked important controls for possible confounding factors such as SES, IQ or linguistic proficiency. Nonetheless, in planning a large-scale study, Peal and Lambert (1962) continued to stress the alleged negative aspects of bilingualism. They state that:

> Many of these studies of the detrimental effects of bilingualism lacked important controls. Taking this into account, the weight of evidence so far presented seems to support the contention that there is no significant difference between monolinguals and bilinguals on nonverbal intelligence, but the bilinguals are likely to be handicapped on verbal intelligence measures (1962, p.3).

Positive Aspects of Bilingualism on Cognitive Development

It is important to note that Peal and Lambert's (1962) well-designed experiment mentioned in the previous section did not confirm any of their original hypotheses. In fact, the French-English bilinguals performed significantly better than the English-speaking monolingual group on all verbal IQ tests

and on some of the nonverbal performance IQ tests as well. In searching for an explanation of their findings, Peal and Lambert point out that the nonverbal tests on which the bilinguals showed superior performance measure symbolic "flexibility" and concept formation as opposed to spatial and perceptual abilities. They conclude that bilinguals:

> ...have a language asset, are more facile at concept formation, and have a greater mental flexibility. The results of factor analyses applied to the data supported the hypothesis that the structure of intellect for the two groups differ. The bilinguals appear to have a more diversified set of mental abilities than the monolinguals (1962, p.22).

An attempt was made to replicate the Peal and Lambert study by matching a group of French-English balanced bilinguals with a control group of monolinguals in SES, sex and age (Cummins and Gulutsan, 1974). On measures of both verbal and nonverbal ability, results showed that bilinguals performed at a significantly higher level than monolinguals.

Explanations of How Bilingualism Positively Affects Cognitive Development

Most of the current theories that view bilingualism as enhancing cognitive development can be aggregated into four basic explanations or hypotheses, according to Cummins (1976): (a) the "experiential enrichment" hypothesis; (b) the "switching"

hypothesis; (c) the "objectification" hypothesis; and (d) the "threshold" hypothesis.

The experiential enrichment hypothesis states that bilingual children are exposed to a wider range of experiences than monolingual children because their experiences occur in the context of two cultures (Peal and Lambert, 1962). The switching hypothesis proposes that bilingual children utilize the two different linguistic perspectives of the languages as an aid in developing a more flexible learning set. Whereas some researchers believe it is the actual process of switching languages that is important (Landry, 1974), others argue that the key to flexibility of learning set can be found in the languages which provide two separate and different perspectives.

The objectification hypothesis is very similar in nature to this second description of the switching hypothesis. The access of a child to two linguistic codes acts as an aid in distinguishing a word from its referrent, and the meaning inherent in an object can be distinguished from the word used to describe it. Leopold (1949) states that by hearing two words for one object, a child begins to attach more importance to its meaning than to the word used to express it.

The most recent theoretical framework concerning bilingualism and cognitive development, and one which is receiving increased attention from educators and researchers, is the

threshold hypothesis of Cummins (1978). Under this theoretical framework, it is possible for bilingualism to have either a negative or positive effect upon a child's cognitive development, depending upon the degree of linguistic competence which is achieved in the two languages. The threshold hypothesis suggests that if a child attains a certain threshold level of linguistic competence in both languages, the beneficial aspects of bilingualism will enhance his cognitive and academic functioning. However, if he fails to attain linguistic proficiency, he will be at a cognitive disadvantage. Moreover, the degree of linguistic proficiency attained in one language is affected directly by that attained in the other language. A child who fails to master sufficient skills in his native language will exhibit similarly limited skills in the second language as well.

Thus, it is possible that certain children who have attained a high level of linguistic proficiency in both languages are able to reap the positive benefits of their bilingualism. Children who are limited speakers of both languages, however, might actually be retarded in their cognitive development.

Bilingualism and Divergent Thinking

The concept of divergent thinking originated from the work of Guilford (1950) and his structure of the intellect. By 1967, a more precise notion of what was meant by divergent thinking was brought forth. Divergent thinking encourages the individual

to generate multiple solutions to problems and to not follow a rigid mental set in problem-solving. It is related to mental flexibility, where flexibility facilitates reinterpretations and reorganizations. Thus, if it is true that competent bilingualism results in better cognitive functioning in the form of mental flexibility, divergent thinking ability also may be enhanced by bilingualism.

The vast majority of studies investigating the relationship between divergent thinking and bilingualism were initiated within the past 10 years. Whereas some of the results of these studies show a negative, or at best, unclear relationship between bilingualism and divergent thinking, others have shown significant results favoring bilinguals over monolinguals.

Although Torrance, Gowan, Wu and Aliotti (1970) reported that grade school monolinguals from Singapore performed significantly better than bilingual children on figural fluency and flexibility of the Torrance Tests of Creative Thinking, bilingual French-English children in the later grades of elementary school performed significantly better than monolinguals on other tests of divergent thinking.

Two more recent studies have reported superior scores for bilingual children on both the figural and verbal portions of the Torrance Tests of Creative Thinking (Carringer, 1974;

Landry, 1974). After analyzing his results Landry concluded that learning a second language in elementary school may increase a child's divergent thinking skills. Carringer concludes from his study of middle school level Mexicans that bilinguals, in learning a second language, develop a high degree of cognitive flexibility which enables them to cope with the negative transfer that is produced by interlingual interference.

The current study sought to investigate further the relationship between divergent thinking and bilingualism, as reported in past studies. A more comprehensive critique of the studies cited in this paper can be found in a review of the literature by Holtzman (1980).

Method

Subjects: Subjects for the current study included 23 Anglos and 108 Mexican-American boys and girls from a semi-rural West Texas community, and 24 additional Mexican-American boys and girls residing in San Antonio, Texas. All subjects were enrolled in the fourth grade, were of a low socioeconomic status and had an average age of just under 10 years, 6 months. An attempt was made not to include any subjects in the study who had shown evidence of emotional disturbance, learning disability or mental retardation, nor were those included who were excessively old when compared to other students in their classes.

Procedures: The degree of linguistic proficiency in Spanish and English was estimated from scores obtained on an individually-administered test called the Oral Language Proficiency Measure (1978). Based upon these scores, the subjects were assigned to one of five experimental groups: (1) monolingual English-speaking Anglos; (2) monolingual English-speaking Mexican-Americans (San Antonio); (3) monolingual Spanish-speaking Mexican-Americans; (4) bilingual limited English, fluent Spanish Mexican-Americans; and (5) fluent bilingual Spanish-English Mexican-Americans. The exact sample size within each language group is shown in Table 1.

Subjects were administered the Raven's Standard Progressive Matrices and the figural and verbal portions of the Torrance Tests of Creative Thinking (TTCT). The Ravens scores served as a covariate in order to control for possible differences in level of IQ, and the TTCT scales of fluency and of flexibility for both verbal and figural tests constituted the four dependent measures.

Hypotheses: Cummins' threshold hypothesis served as the theoretical framework upon which the hypotheses for the study were based (Cummins, 1978). It was hypothesized that for both figural and verbal fluency and flexibility, as measured by the TTCT, (1) highly fluent bilinguals would have higher divergent thinking scores than the bilinguals who were completely fluent only in one language; (2) the limited English, fluent Spanish bilinguals

Table 1

Sample Size for Language Groups

Groups	Males	Females	Total
Monolingual English-speaking Mexican Americans	12	12	24
Monolingual Spanish-speaking Mexican Americans	17	12	29
Monolingual English-speaking Anglos	10	13	23
Limited-English, Fluent Spanish Mexican Americans	11	16	27
Fluent Bilingual Mexican Americans	13	15	28
TOTALS	63	68	131

would have a lower degree of divergent thinking than the three monolingual groups; and (3) the Spanish-speaking monolinguals would show the same degree of divergent thinking as the English-speaking Anglo and Mexican-American monolinguals. In addition, no sex differences were anticipated.

Results and Discussion

Preliminary analyses: The first analyses were conducted using t-tests on the grand means of both sexes on each dependent variable, and additional comparisons were made comparing boys and girls within each language group. Since significant differences were not obtained, all subsequent analyses were carried out for boys and girls combined. Four different analyses then were made for each of the scores on the TTCT. First, a simple analysis of variance was performed without controlling for IQ or SES. The ANCVA program of SPSS was used to compute each F-ratio. Next, the ONEWAY subprogram of SPSS was used to perform three analyses of covariance: (1) an analysis controlling IQ by using the Ravens raw score as a covariate; (2) an analysis controlling for SES by employing father's occupational level as a covariate; and (3) a final analysis controlling for both SES and IQ by using these two covariates together.

Mean scores in divergent thinking for each of the five language groups are presented in Table 2. The F-ratios for figural measures were highly significant, but not those for

Table 2

Results from Analysis of Variance of Means Scores in Divergent Thinking Across the Five Language Groups

	N	Figural Fluency	Figural Flexibility	Verbal Fluency	Verbal Flexibility
Monolingual English-speaking Mexican Americans	24	22.2	18.0	30.2	14.1
Monolingual Spanish-speaking Mexican Americans	29	22.6	20.6	32.7	11.7
Monolingual English-speaking Anglos	23	17.8	13.2	33.6	14.6
Limited-English, Fluent Spanish Mexican Americans	27	19.5	15.7	30.0	11.7
Fluent Bilingual Mexican Americans	28	21.7	17.3	39.3	14.7
Error Mean Square Variance Estimates		39.3	19.7	335.0	42.5
F-ratios		7.44	9.81	1.16	1.49
p-value		.001	.001	.33	.21

verbal measures; as a result, several post hoc comparisons were later performed on the figural measures. For each of the covariance analyses, controlling for intelligence, socioeconomic status, or both failed to make any appreciable difference in the significance obtained in divergent thinking scores across the five language groups. As a result, these variables were dropped from consideration in later analyses.

Planned comparisons: A series of planned comparisons were conducted using the SPSS subprogram ONEWAY which allows for (K-1) a priori contrasts to be performed. Hypothesis 1, which stated that highly fluent bilinguals would have higher divergent thinking scores than the bilinguals who were completely fluent only in one language, was supported for Verbal Fluency but fell just short of significance for Verbal Flexibility (Table 3). As is shown in Table 3, p=.05 for Verbal Fluency and p=.09 for Verbal Flexibility.

Hypothesis 2, on the other hand, was not supported for any of the four dependent variables. It had been expected that the limited English, fluent Spanish bilinguals would have a lower degree of divergent thinking than the three monolingual groups, but this was not the case. Results were almost significant for Figural Fluency (p=.06) but were clearly insignificant for both of the verbal measures (Table 3).

Hypothesis 3 was supported for verbal but not for figural

Table 3.

Results of Planned Contrasts for Language Groups Using TTCT as the Dependent Measures

Planned Contrasts	Fluency			Flexibility		
	t-Value	D.F.	Level of Sig.	t-Value	D.F.	Level of Sig.
Verbal Tests (TTCT)						
Hypothesis 1 Fluent Bilinguals vs. Limited Bilinguals	1.90	126	.05	1.71	126	.09
Hypothesis 2 Three Monolingual Groups vs. Limited Bilinguals	.54	126	.59	1.23	126	.22
Hypothesis 3 English-speaking Monolingual Groups vs. Spanish-speaking monolinguals	-.19	126	.85	1.73	126	.09
Figural Tests (TTCT)						
Hypothesis 4 Fluent Bilinguals vs. Limited Bilinguals	1.30	126	.20	1.32	126	.19
Hypothesis 5 Three Monolingual Groups vs. Limited Bilinguals	1.94	126	.06	1.55	126	.13
Hypothesis 6 English-speaking Monolingual Groups vs. Spanish-speaking Monolinguals	-4.40	126	.001	-4.74	126	.001

measures. Since all subjects in the three monolingual groups could speak only one language, there was no reason to expect that subjects fluent in English would attain a higher level of divergent thinking than subjects who are fluent in Spanish, or vice versa. However, contrary to expectations, the means for Figural Fluency and Figural Flexibility for the Spanish monolingual group were significantly higher than the average of the means of the English monolingual groups (Table 3). Both contrasts were highly significant at the p=.001 level.

In summary, it can be said with caution that the results from the TTCT verbal tests generally are supportive of Cummins' threshold hypothesis, but the differences among the language groups were not large enough to draw definitive conclusions. The pattern and rank order of mean scores was consistent with the hypotheses, with fluent bilinguals achieving the highest scores, followed by the three monolingual groups and the limited-English, fluent Spanish group. In sharp contrast were the results from the figural measures; not only were the hypotheses rejected, but also the Spanish monolinguals demonstrated a surprisingly superior performance.

Post hoc Analyses: In order to understand more clearly the relationships between groups on the dependent measures, a small number of post hoc comparisons were conducted on TTCT figural test scores using Duncan's multiple range test (p=.05) from

the SPSS subprogram ONEWAY. No comparisons were conducted on verbal measures because the original analysis of variance had not produced an overall significant F.

The major finding was that the Spanish monolingual group performed significantly better than the other four groups on Figural Fluency and Figural Flexibility. In addition, all groups except the limited English, fluent Spanish bilinguals obtained significantly higher scores than the Anglo monolingual group on Figural Fluency and all groups scored significantly better than the Anglo group on Figural Flexibility.

These results were unexpected and are difficult to interpret. The pattern of means from figural tests was quite different from that which was obtained from verbal tests. Perhaps some type of factor related to ethnic background or culture is involved here. It seems logical that the Spanish monolingual group would be the least acculturated and would be the most representative of Mexican culture. The Anglo group, on the other hand, would be the most representative of Anglo culture. If the results do reflect a cultural factor, one possible explanation might be that the Spanish monolingual group was exposed to childrearing practices which facilitated this type of figural divergent thinking whereas the Anglos did not benefit to the same extent from the different childrearing practices

to which they were exposed. Another possible explanation might be that the Spanish monolinguals were able to demonstrate their true ability on the figural tests but were hindered on the verbal tests because of an inability to write their ideas in either English or Spanish.

Group Differences in Ravens Percentile Scores: Besides the above post hoc comparisons on the TTCT dependent measures, additional analyses were conducted on percentile scores from the Ravens. A significant overall F was obtained in the analysis of variance across the five groups for the Ravens, suggesting that further analyses should be performed in order to determine the nature of these differences ($F=7.36$, $p=.001$). Once again, the Duncan multiple range test was used with the significance level set at $p=.05$. Results showed that the Spanish monolinguals obtained significantly lower scores than the other four groups. The two groups of English monolinguals achieved significantly higher scores than either of the bilingual groups.

In interpreting these results, it is interesting to note the rank order of the percentile scores. As the ability to speak English increases, there is an accompanying increase in Ravens scores (Table 4). The Pearson product-moment correlation between English raw scores of the Oral Language Proficiency Measure and Ravens percentile scores was .83 ($p=.001$) (Table 5).

Table 4

Raven Percentiles and Raw Score Means for Language Groups

	Percentiles	Raw Scores
Monolingual English-speaking Anglos	66.7	33.4
Monolingual English-speaking Mexican Americans	63.9	31.7
Fluent Bilingual Mexican-Americans	50.5	28.0
Limited-English, Fluent Spanish Mexican Americans	50.0	27.8
Monolingual Spanish-speaking Mexican Americans	36.8	26.0

Table 5

Intercorrelations for all Variables in the Total Sample of 131 Cases

	SES 2	Age 3	OLPM English Raw 4	OLPM Spanish Raw 5	Ravens Raw 6	Ravens Percentile 7	Ravens Time on Task 8	Figural Fluency 9	Figural Flexibility 10	Verbal Fluency 11	Verbal Flexibility 12
1. Sex	-.1431 S=.053	-.1877 S=.016	.1562 S=.063	.0398 S=.350	.0570 S=.259	.0820 S=.176	.2233 S=.005	-.1383 S=.058	-.1233 S=.080	.0755 S=.196	.1128 S=.100
2. SES		-.1808 S=.020	.2431 S=.009	-.6948 S=.001	.2178 S=.007	.2737 S=.001	-.0988 S=.134	-.1633 S=.032	-.1575 S=.037	-.1419 S=.054	.0664 S=.227
3. Age			-.3601 S=.001	.2969 S=.002	-.1205 S=.085	-.4009 S=.001	.0514 S=.281	.0939 S=.143	.0610 S=.245	-.1996 S=.011	-.3318 S=.001
4. OLPM English Raw				-.5134 S=.001	.2321 S=.011	.3270 S=.001	-.1521 S=.070	-.4250 S=.001	-.3888 S=.001	-.0825 S=.211	.0497 S=.315
5. OLPM Spanish Raw					-.2449 S=.008	-.3344 S=.001	.2822 S=.003	.0369 S=.361	-.0032 S=.488	.0973 S=.173	-.0974 S=.173
6. Ravens Raw						.9326 S=.001	.1440 S=.052	-.2823 S=.001	-.2864 S=.001	.0725 S=.205	.2754 S=.001
7. Ravens Percentile							.0966 S=.138	-.2928 S=.001	.2751 S=.001	.1342 S=.063	.3713 S=.001
8. Ravens Time on Task								-.2728 S=.001	-.2977 S=.001	-.0849 S=.169	.0094 S=.458
9. Figural Fluency									.8835 S=.001	.2963 S=.001	.0882 S=.158
10. Figural Flexibility										.2502 S=.002	.1027 S=.122
11. Verbal Fluency											.6958 S=.001

One of the reasons why the Ravens was selected for use in this study was that subjects do not respond verbally to test items; instead, they use nonverbal reasoning and spatial and perceptual abilities to help them solve the problems. However, as reported by Raven, Court and Raven (1978), some investigators have suggested that the Ravens Matrices require subjects to engage in much verbal mediation. If this is true, subjects who are not fluent in at least one language would be expected to perform poorly on this test. But even if this were the case, it does not explain why fluent English monolinguals would obtain higher scores than fluent Spanish monolinguals. The reason for the differences in scores might be some other variable which was not investigated (e.g., culture, experience with standardized tests, etc.).

Intercorrelations Among IQ, SES and Divergent Thinking: Table 5 shows a number of interesting correlations, several of which are of particular relevance. The correlation between SES and Ravens percentiles was significant statistically speaking, but was rather low to be considered a major factor in the results (.27). The correlations among SES and the TTCT dependent measures were even lower, and were not significant, ranging from -.16 to .07. There were significant low to moderate correlations among Ravens percentiles and the TTCT measures, with the largest correlation occuring for Verbal Flexibility (.37). Thus, the current study provides additional support for the

belief that divergent thinking is fairly independent of IQ, and these results are compatible with those reported by Torrance (1974) from a series of studies which compared TTCT scores to those of different measures of IQ.

Summary and Implications of Findings

Results showed an entirely different pattern for figural as opposed to verbal divergent thinking. Predictions of superiority for fluent bilinguals were proved incorrect, and instead, the Spanish-speaking monolingual group demonstrated significantly better performance on figural tests of the TTCT than the four other groups. One possible explanation for these results might be that the type of "mental flexibility" which bilingual individuals are supposed to have relates much more to ideational fluency and flexibility as measured on the verbal scale than it does to the abilities measured on the figural scale.

This thesis is only partially supported, however, by the results from the verbal tests. As predicted, the fluent bilinguals obtained significantly higher scores on Verbal Fluency than the limited English, fluent Spanish bilinguals and a trend in the predicted direction occured for Verbal Flexibility as well. The fluent bilinguals also obtained higher scores on both of the verbal measures than the three monolingual groups, but the results failed to reach significance.

An additional finding was that significant differences existed

across language groups on the Raven's Matrices but the intercorrelations among Raven percentile scores, occupational level and the TTCT divergent thinking measures all were rather low. It was concluded from the results of this study that TTCT divergent thinking and the type of intelligence measured by the Ravens appear to be two almost totally independent constructs.

Future research in the general area of cognition and bilingualism could be invaluable in determining the precise conditions under which the bilingual individual could come to profit from bilingualism, and what constitutes these positive benefits. On the other hand, as stressed by Cummins, insufficient degrees of bilingualism could also have negative effects, and the interdependence of both languages may be an important factor to consider. Whatever the case happens to be, the implications for the future of bilingual education programs in our public schools are enormous.

REFERENCES

Carringer, D. C. Creative thinking abilities of Mexican youth: The relationship of bilingualism. Journal of Cross-Cultural Psychology, 1974, 5, 492-504.

Cummins, J. Educational implications of mother tongue maintenance in minority-language groups. In S. T. Carey (Ed.), The Canadian Modern Language Review, 1978, 34, 395-416.

Cummins, J. The influence of bilingualism on cognitive growth: A synthesis of research findings and explanatory hypotheses. Working Papers on Bilingualism, 1976, no. 9, 1-43.

Cummins, J., & Gulutsan, M. Bilingual education and cognition. Alberta Journal of Educational Research, 1974, 5, 259-266.

Darcy, N. T. The effect of bilingualism upon the measurement of the intelligence of children of preschool age. Journal of Educational Psychology, 1946, 37, 21-44.

Guilford, J. P. Creativity. American Psychologist, 1950, 5, 444-454.

Guilford, J. P. The nature of human intelligence. New York, N. Y.: McGraw-Hill, 1967.

Holtzman, Jr., W. H. Divergent thinking as a function of the degree of bilingualism of Mexican-American and Anglo fourth-grade students. Unpublished doctoral dissertation, University of Texas at Austin, 1980.

Jackson, S. L., & Hidalgo, R. Where do we go from here? Using language assessment for planning bilingual programs. Unpublished manuscript, 1979.

Landry, R. G. A comparison of second language learners and monolinguals on divergent thinking tasks at the elementary school level. The Modern Language Journal, 1974, 58, 10-15.

Leopold, W. F. Speech development of a bilingual child. Vol. 3. Evanston: Northwestern University Press, 1949.

Levinson, B. M. A comparison of the performance of bilingual and monolingual native born Jewish preschool children of traditional parentage on four intelligence tests. Journal of Clinical Psychology, 1959, 15, 74-76.

MacNamara, J. Bilingualism and primary education. Edinburgh? Edinburgh University Press, 1966.

Oral Language Proficiency Measure. El Paso Public Schools, Department of Curriculum and Staff Development, 1978.

Peal, E., & Lambert, W. E. The relation of bilingualism to intelligence. Psychological Monographs, 1962, 76, no. 546.

Raven, J. C., Court, J. H. & Raven, J. Manual for Raven's Progressive Matrices and Vocabulary Scales: General Overview. London: H. K. Lewis Co. Ltd., 1978.

Seidl, J. C. G. The effect of bilingualism in the measurement of intelligence. Unpublished doctoral dissertation, Fordham University, 1937.

Torrance, E. P. Torrance tests of creative thinking: Norms-technical manual. Lexington, Mass.: Ginn and Company, 1974.

Torrance, E. P., Gowan, J. C., Wu, J. M., & Aliotti, N. C. Creative functioning of monolingual and bilingual children in Singapore. Journal of Educational Psychology, 1970, 61, 72-75.

Weinreich, U. Languages in contact. New York: Linguistic Circle of New York, 1953.